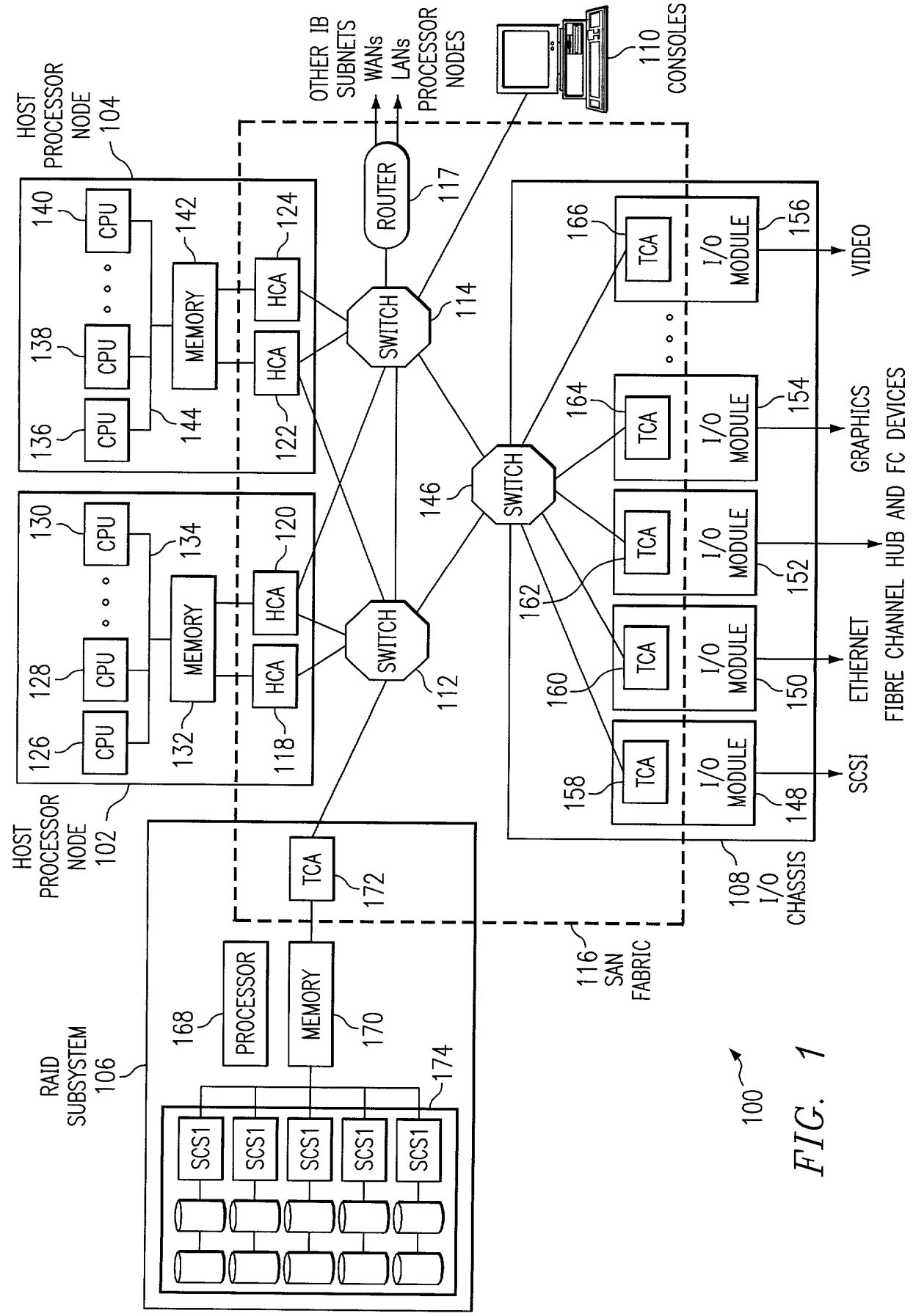

HOST PROCESSOR NODE 104
HOST PROCESSOR NODE 102
CPU
MEMORY
HCA
SWITCH
ROUTER
OTHER IB SUBNETS
WANs
LANs
PROCESSOR NODES
CONSOLES
TCA
I/O MODULE
VIDEO
GRAPHICS
ETHERNET
SCSI
FIBRE CHANNEL HUB AND FC DEVICES
I/O CHASSIS
SAN FABRIC
RAID SUBSYSTEM
PROCESSOR
SCSI

FIG. 1

FIG. 2

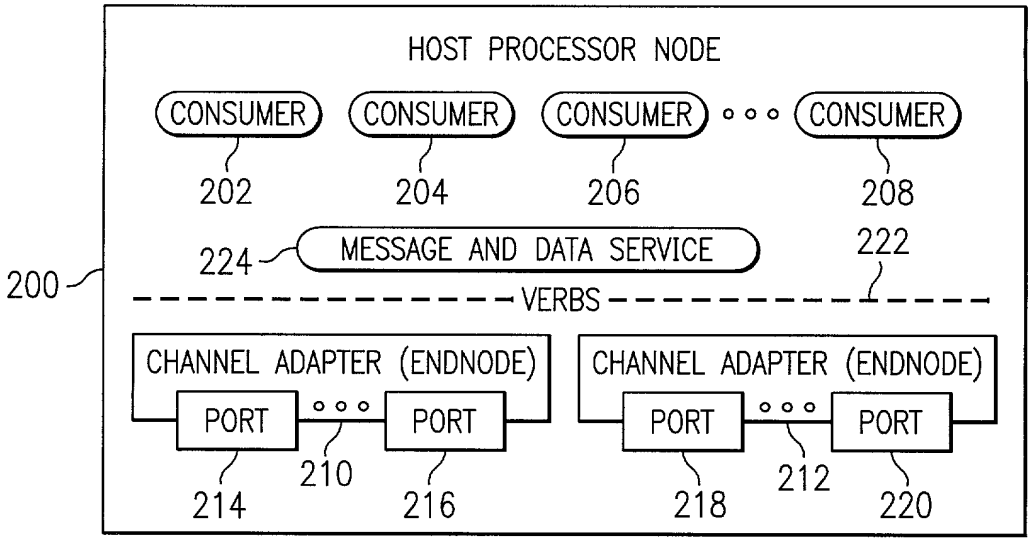

HOST PROCESSOR NODE
CONSUMER
CONSUMER
CONSUMER
CONSUMER
202
204
206
208
224
MESSAGE AND DATA SERVICE
222
200
VERBS
CHANNEL ADAPTER (ENDNODE)
CHANNEL ADAPTER (ENDNODE)
PORT
PORT
PORT
PORT
210
212
214
216
218
220

FIG. 3A

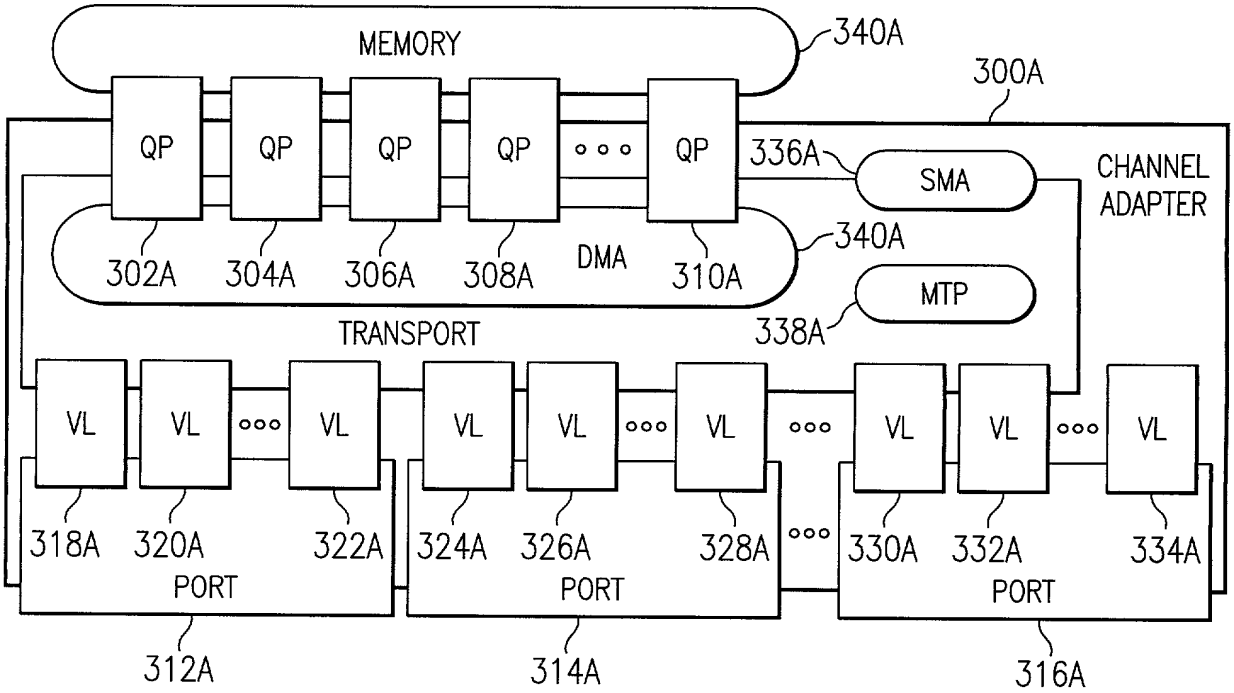

MEMORY
340A
300A
QP
QP
QP
QP
QP
336A
SMA
CHANNEL ADAPTER
340A
DMA
302A
304A
306A
308A
310A
MTP
338A
TRANSPORT
VL
VL
VL
VL
VL
VL
VL
VL
VL
318A
320A
322A
324A
326A
328A
330A
332A
334A
PORT
PORT
PORT
312A
314A
316A

FIG. 3B

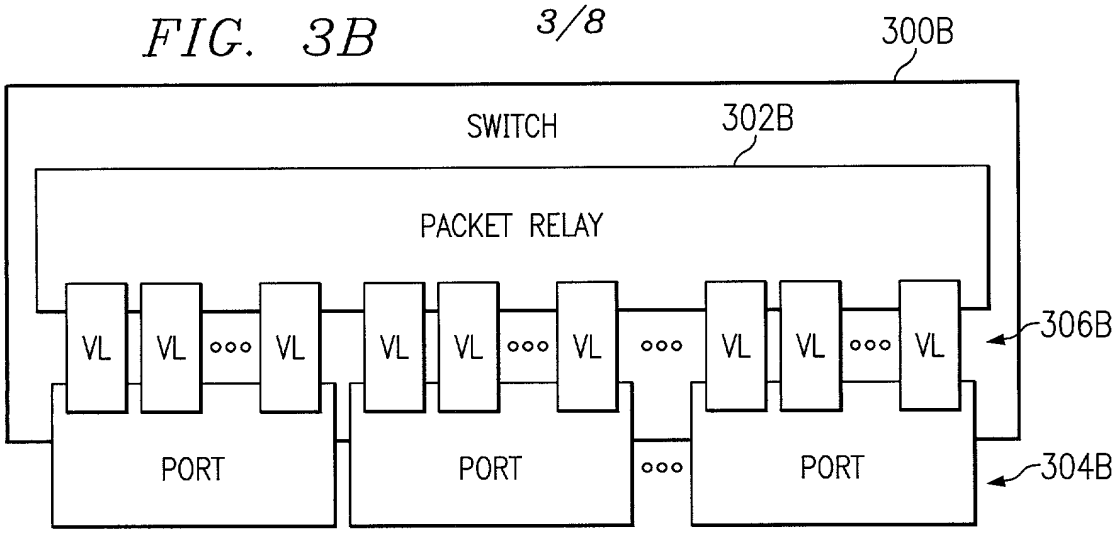


FIG. 3C

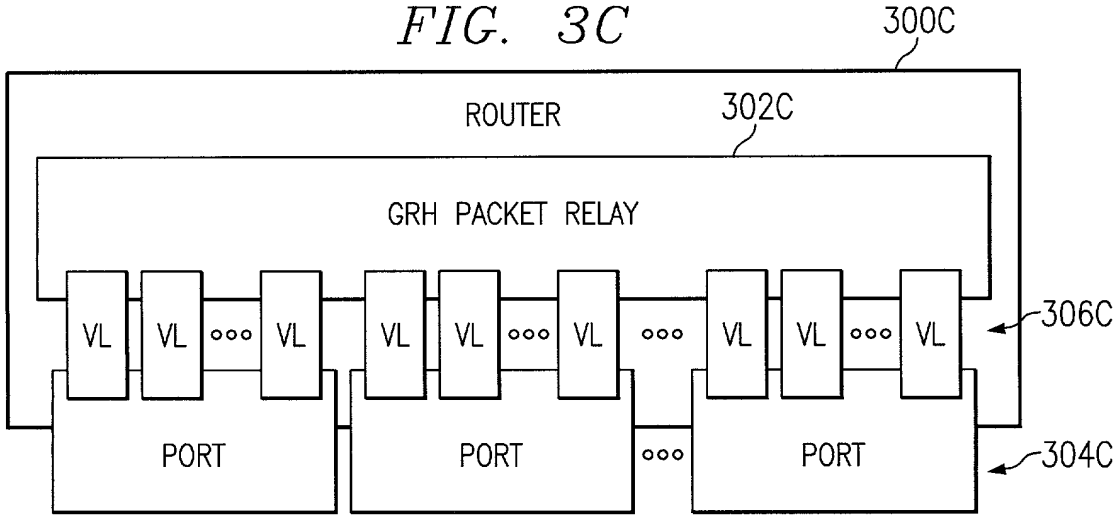


FIG. 9

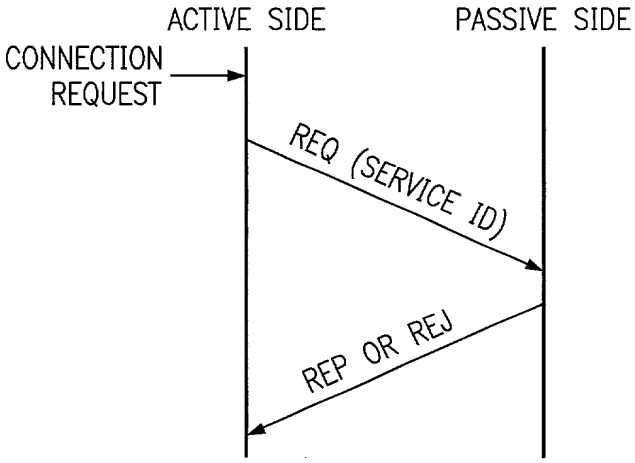


FIG. 10

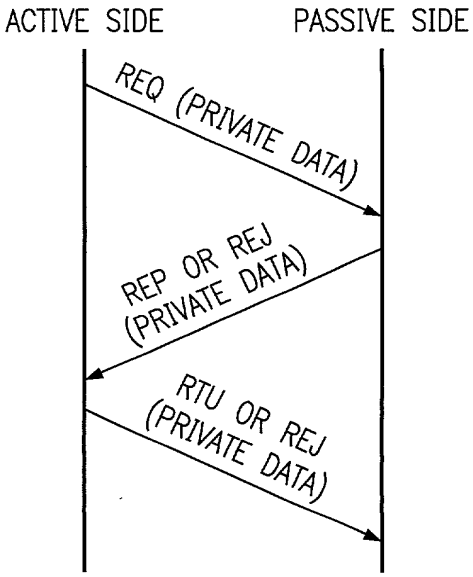


FIG. 4

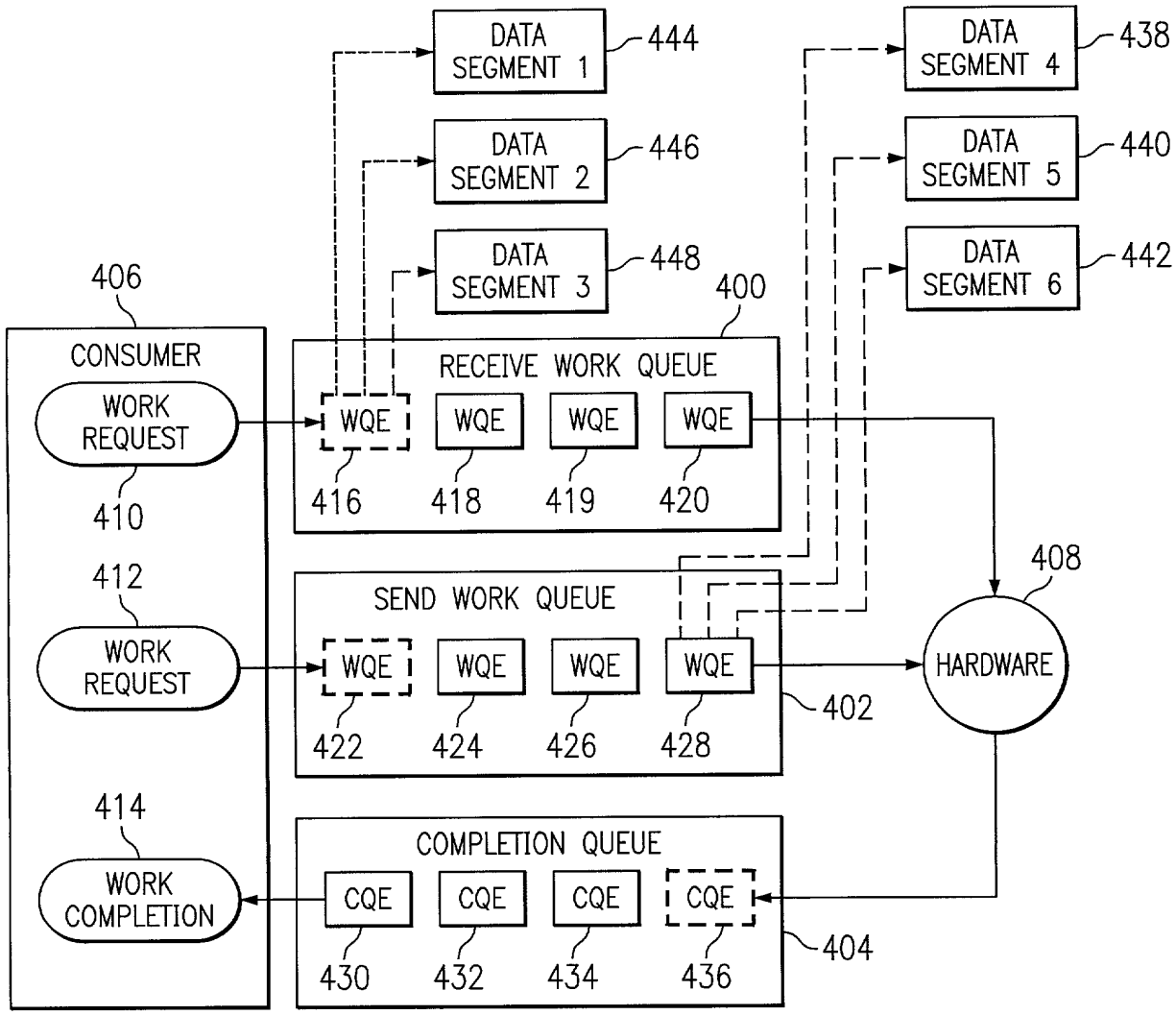

DATA SEGMENT 1
444
DATA SEGMENT 2
446
DATA SEGMENT 3
448
DATA SEGMENT 4
438
DATA SEGMENT 5
440
DATA SEGMENT 6
442
406
CONSUMER
WORK REQUEST
410
412
WORK REQUEST
414
WORK COMPLETION
400
RECEIVE WORK QUEUE
WQE
WQE
WQE
WQE
416
418
419
420
SEND WORK QUEUE
WQE
WQE
WQE
WQE
422
424
426
428
402
408
HARDWARE
COMPLETION QUEUE
CQE
CQE
CQE
CQE
430
432
434
436
404

FIG. 5

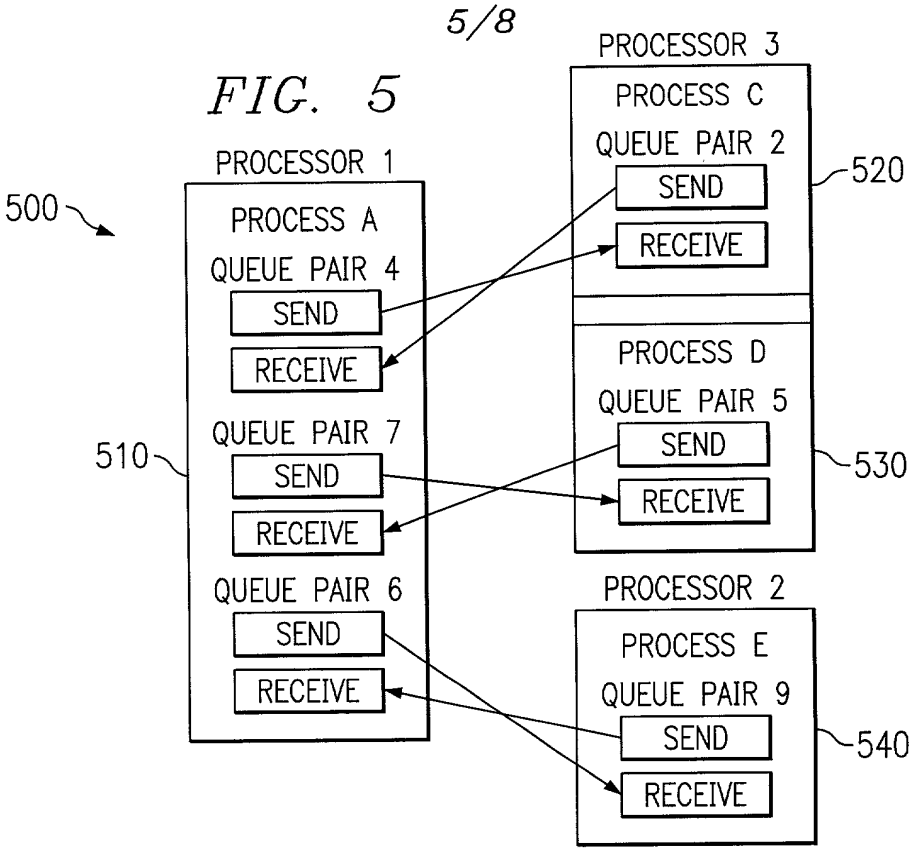

PROCESSOR 3
PROCESS C
QUEUE PAIR 2
SEND
RECEIVE
520
PROCESSOR 1
500
PROCESS A
QUEUE PAIR 4
SEND
RECEIVE
PROCESS D
QUEUE PAIR 5
SEND
RECEIVE
530
QUEUE PAIR 7
510
SEND
RECEIVE
QUEUE PAIR 6
SEND
RECEIVE
PROCESSOR 2
PROCESS E
QUEUE PAIR 9
SEND
RECEIVE
540

FIG. 6

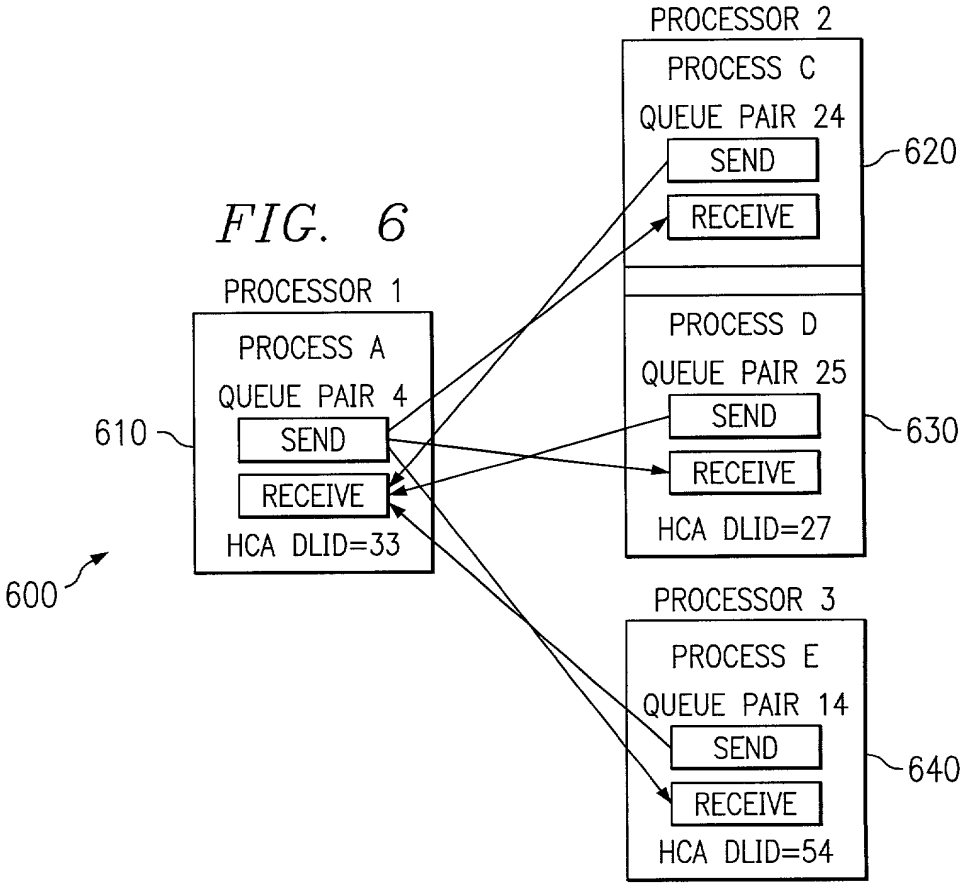

PROCESSOR 2
PROCESS C
QUEUE PAIR 24
SEND
RECEIVE
620
PROCESSOR 1
PROCESS A
QUEUE PAIR 4
610
SEND
RECEIVE
HCA DLID=33
PROCESS D
QUEUE PAIR 25
SEND
RECEIVE
630
HCA DLID=27
600
PROCESSOR 3
PROCESS E
QUEUE PAIR 14
SEND
RECEIVE
640
HCA DLID=54

FIG. 7

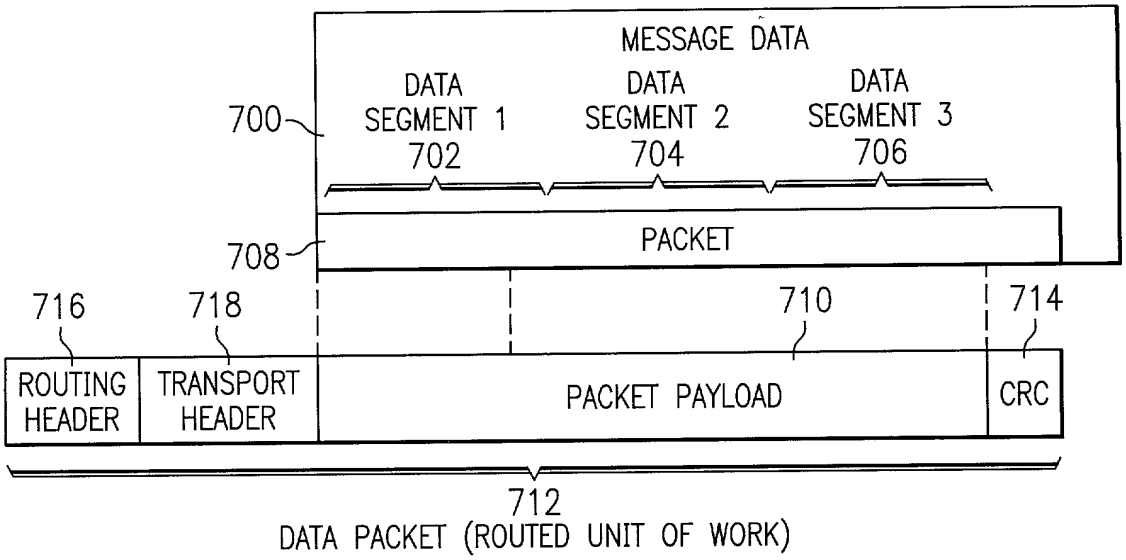

MESSAGE DATA
DATA SEGMENT 1 702
DATA SEGMENT 2 704
DATA SEGMENT 3 706
700
PACKET
708
716
718
710
714
ROUTING HEADER
TRANSPORT HEADER
PACKET PAYLOAD
CRC
712
DATA PACKET (ROUTED UNIT OF WORK)

FIG. 8

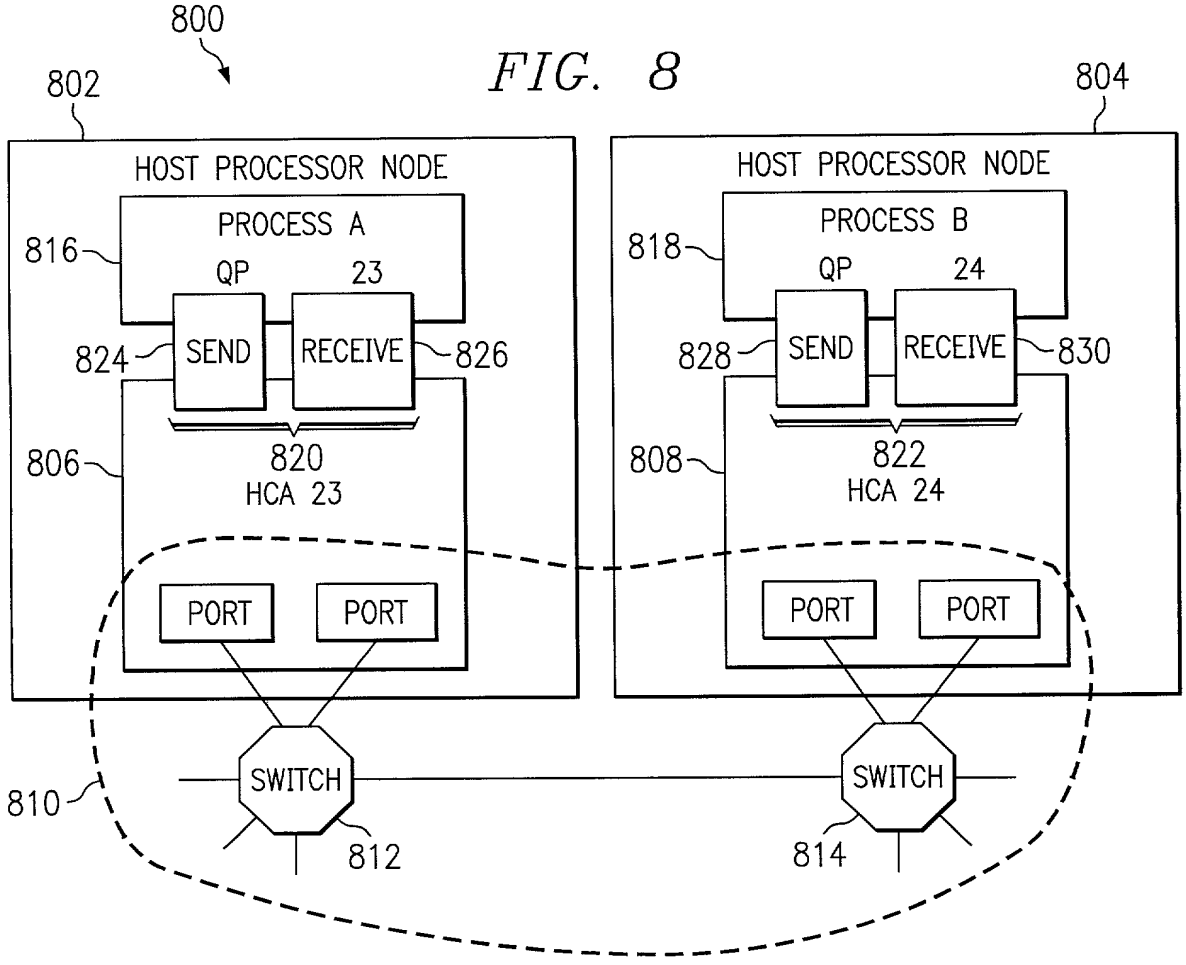
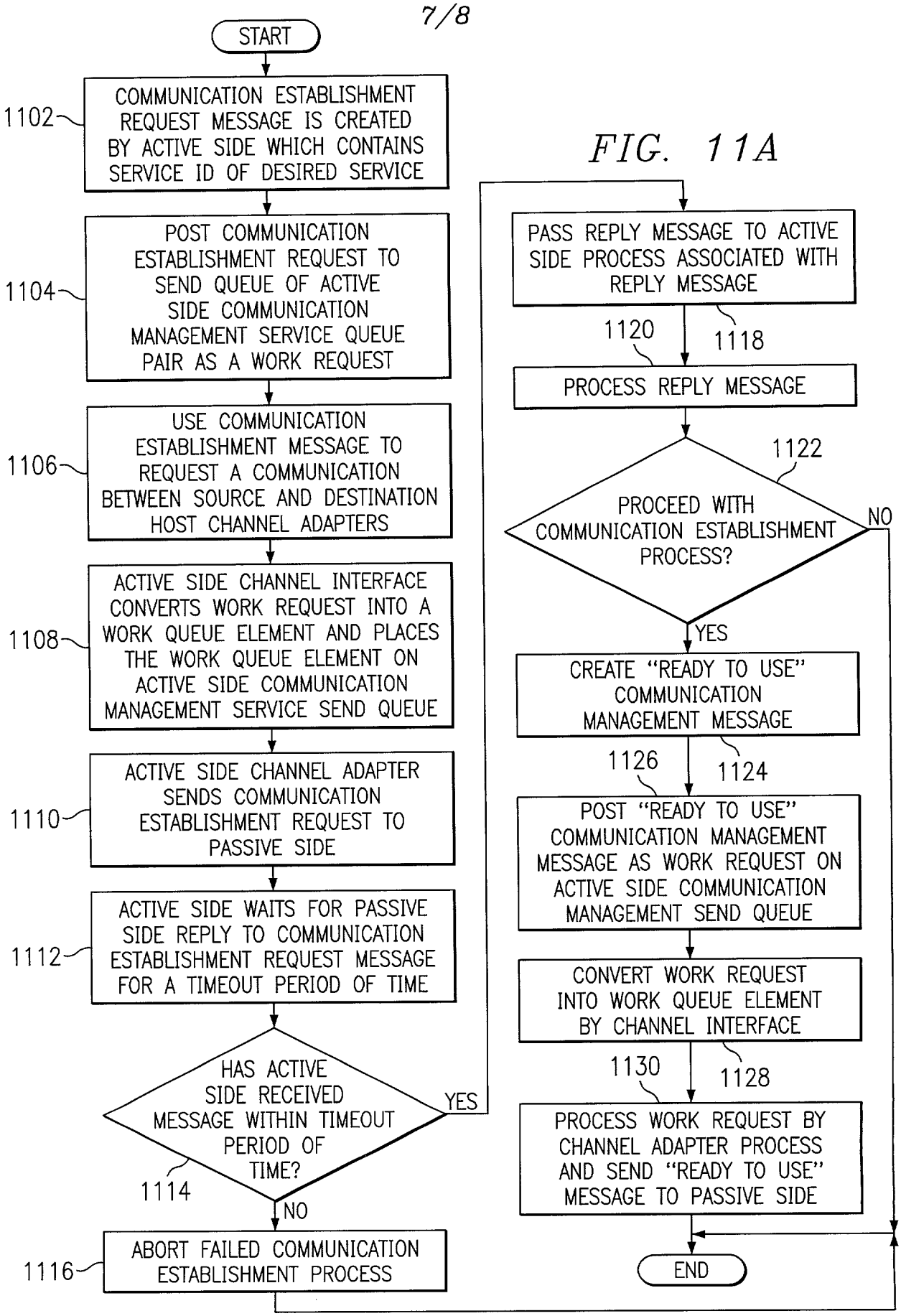

800
802
804
HOST PROCESSOR NODE
HOST PROCESSOR NODE
PROCESS A
PROCESS B
816
818
QP 23
QP 24
SEND
RECEIVE
824
826
828
830
820
HCA 23
822
HCA 24
806
808
PORT
PORT
PORT
PORT
SWITCH
SWITCH
810
812
814

FIG. 11A


START
1102
COMMUNICATION ESTABLISHMENT REQUEST MESSAGE IS CREATED BY ACTIVE SIDE WHICH CONTAINS SERVICE ID OF DESIRED SERVICE
1104
POST COMMUNICATION ESTABLISHMENT REQUEST TO SEND QUEUE OF ACTIVE SIDE COMMUNICATION MANAGEMENT SERVICE QUEUE PAIR AS A WORK REQUEST
1106
USE COMMUNICATION ESTABLISHMENT MESSAGE TO REQUEST A COMMUNICATION BETWEEN SOURCE AND DESTINATION HOST CHANNEL ADAPTERS
1108
ACTIVE SIDE CHANNEL INTERFACE CONVERTS WORK REQUEST INTO A WORK QUEUE ELEMENT AND PLACES THE WORK QUEUE ELEMENT ON ACTIVE SIDE COMMUNICATION MANAGEMENT SERVICE SEND QUEUE
1110
ACTIVE SIDE CHANNEL ADAPTER SENDS COMMUNICATION ESTABLISHMENT REQUEST TO PASSIVE SIDE
1112
ACTIVE SIDE WAITS FOR PASSIVE SIDE REPLY TO COMMUNICATION ESTABLISHMENT REQUEST MESSAGE FOR A TIMEOUT PERIOD OF TIME
HAS ACTIVE SIDE RECEIVED MESSAGE WITHIN TIMEOUT PERIOD OF TIME?
1114
YES
NO
1116
ABORT FAILED COMMUNICATION ESTABLISHMENT PROCESS
PASS REPLY MESSAGE TO ACTIVE SIDE PROCESS ASSOCIATED WITH REPLY MESSAGE
1120
1118
PROCESS REPLY MESSAGE
1122
PROCEED WITH COMMUNICATION ESTABLISHMENT PROCESS?
NO
YES
CREATE "READY TO USE" COMMUNICATION MANAGEMENT MESSAGE
1126
1124
POST "READY TO USE" COMMUNICATION MANAGEMENT MESSAGE AS WORK REQUEST ON ACTIVE SIDE COMMUNICATION MANAGEMENT SEND QUEUE
CONVERT WORK REQUEST INTO WORK QUEUE ELEMENT BY CHANNEL INTERFACE
1130
1128
PROCESS WORK REQUEST BY CHANNEL ADAPTER PROCESS AND SEND "READY TO USE" MESSAGE TO PASSIVE SIDE
END

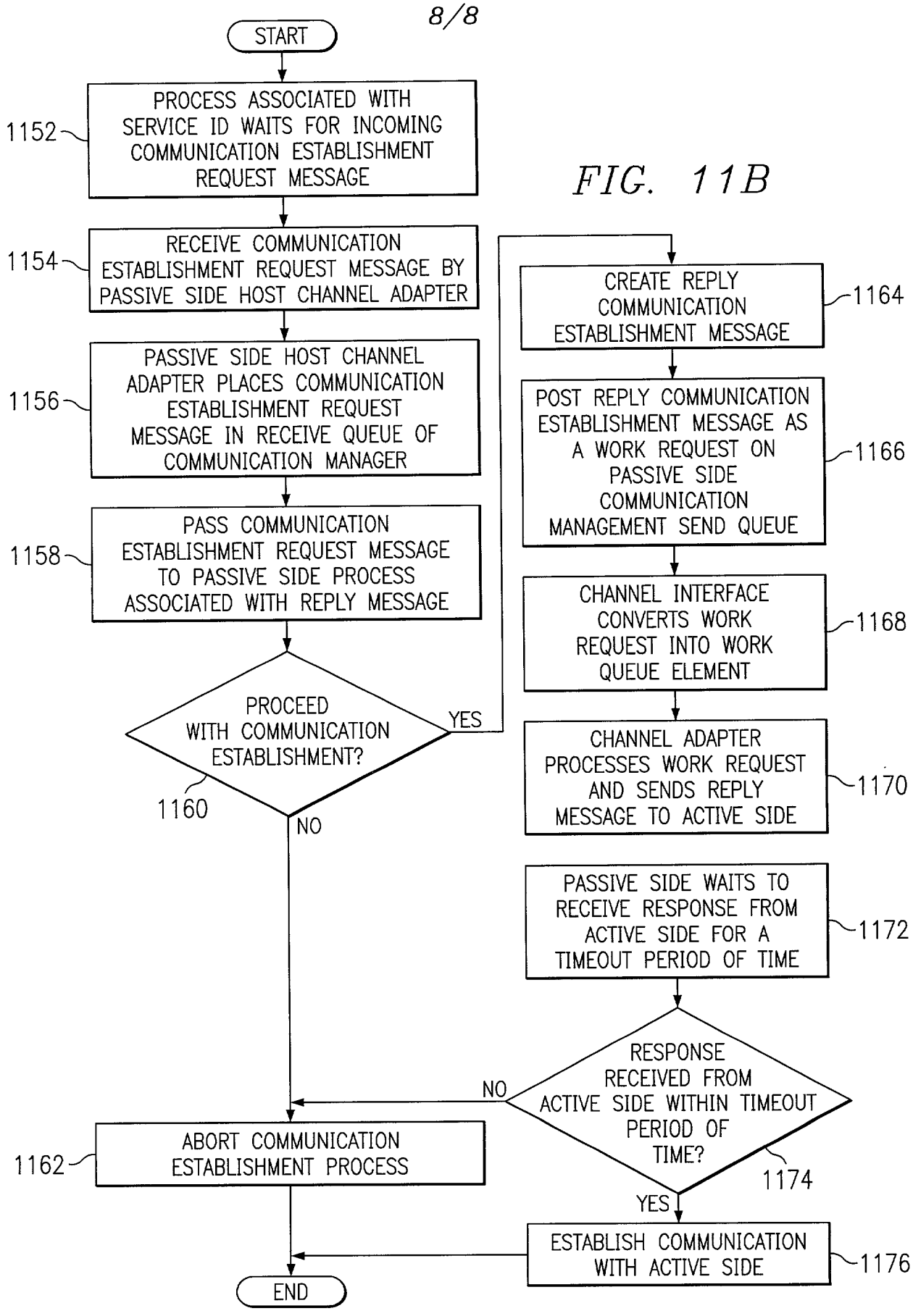

START
PROCESS ASSOCIATED WITH SERVICE ID WAITS FOR INCOMING COMMUNICATION ESTABLISHMENT REQUEST MESSAGE
1152
RECEIVE COMMUNICATION ESTABLISHMENT REQUEST MESSAGE BY PASSIVE SIDE HOST CHANNEL ADAPTER
1154
PASSIVE SIDE HOST CHANNEL ADAPTER PLACES COMMUNICATION ESTABLISHMENT REQUEST MESSAGE IN RECEIVE QUEUE OF COMMUNICATION MANAGER
1156
PASS COMMUNICATION ESTABLISHMENT REQUEST MESSAGE TO PASSIVE SIDE PROCESS ASSOCIATED WITH REPLY MESSAGE
1158
PROCEED WITH COMMUNICATION ESTABLISHMENT?
1160
YES
NO
ABORT COMMUNICATION ESTABLISHMENT PROCESS
1162
CREATE REPLY COMMUNICATION ESTABLISHMENT MESSAGE
1164
POST REPLY COMMUNICATION ESTABLISHMENT MESSAGE AS A WORK REQUEST ON PASSIVE SIDE COMMUNICATION MANAGEMENT SEND QUEUE
1166
CHANNEL INTERFACE CONVERTS WORK REQUEST INTO WORK QUEUE ELEMENT
1168
CHANNEL ADAPTER PROCESSES WORK REQUEST AND SENDS REPLY MESSAGE TO ACTIVE SIDE
1170
PASSIVE SIDE WAITS TO RECEIVE RESPONSE FROM ACTIVE SIDE FOR A TIMEOUT PERIOD OF TIME
1172
RESPONSE RECEIVED FROM ACTIVE SIDE WITHIN TIMEOUT PERIOD OF TIME?
1174
NO
YES
ESTABLISH COMMUNICATION WITH ACTIVE SIDE
1176
END

FIG. 11B